

WHAT IS CLAIMED IS:

1. A method of ensuring proper contact between a plurality of substrates and a lifting device with a plurality of vacuum pads in a semiconductor packaging process wherein the substrates are placed one each in depressions in a substrate tray and in each depression there is a hole, the method comprising:
- raising a plate with a plurality of protrusions through the tray, with each protrusion going through a hole;
 - lowering the lifting device onto the tray;
 - stopping when the vacuum pads from the lifting device comes into contact with the substrates; and
 - applying a vacuum at the nozzles to temporarily attach the substrates to the nozzles.
2. The method of claim 1, wherein the protrusions on the plate are of sufficient height to lift the substrates up off the bottom of the tray.
3. The method of claim 1, wherein the protrusions on the plate are of sufficient height to lift the substrates up off the bottom of the tray and over the depressions in which they lay.

4. The method of claim 1, wherein the holes in the tray are sufficiently size to permit the protrusions to come through the bottom of the tray.

5 5. The method of claim 4, wherein the holes in the tray are small enough to prevent the substrates from falling through.

6. The method of claim 1, wherein the method further comprising the step of raising the lifting device out of the tray after applying the vacuum.

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7. The method of claim 1, wherein the protrusions are arranged in a two-dimensional array on the plate.

8. The method of claim 1, wherein the protrusions are arranged in a
15 linear array on a strip and a plurality of strips are joined to form the plate.

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9. An apparatus for lifting substrates in a semiconductor packaging process, the apparatus comprising:

a plate with a plurality of protrusions;

a substrate tray with a plurality of depressions and a hole in each depression coupled to the plate, the substrate tray to hold a substrate in each depression;

a lifting device with a plurality of vacuum pads coupled to the substrate tray, the lifting device to attach to the substrates and lift the substrates out of the substrate tray;

a first actuator coupled to the plate, the first actuator to raise and lower the plate; and

a second actuator coupled to the flipping device, the second actuator to lower and raise the lifting device.

10. The apparatus of claim 9, wherein the protrusions are flat at their tops.

11. The apparatus of claim 10, wherein the protrusions are rectangular in cross section.

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12. The apparatus of claim 10, wherein the protrusions are square in cross section.

13. The apparatus of claim 9, wherein the first and second actuators are
5 pneumatic actuators.

14. The apparatus of claim 9, wherein the first and second actuators are hydraulic actuators.

10 15. The apparatus of claim 9, wherein the protrusions are of sufficient height so that when the plate is raised into the bottom of the tray, the protrusions lift the substrates up off the bottom of the tray.

16. The apparatus of claim 9 further comprising a third actuator coupled
15 to the lifting device, the third actuator to move the lifting device away from the tray to a different position.

17. The apparatus of claim 16, wherein the third actuator moves the
lifting device after the lifting device has been raised back up after lifting
20 substrates from the substrate tray.

18. The apparatus of claim 9 further comprising a vacuum generator coupled to the flipping device, the vacuum generator to produce a vacuum at each vacuum pad of the flipping device to form a temporary bond between the vacuum pad and the substrate.

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19. A system for applying solder bumps to substrates in a flip chip packaging process, the system comprising:

a loader station to load substrates into a substrate tray;

a flipping station coupled to the loader station, the flipping station to
5 flip substrates held in the substrate tray, the flipping station comprising:

a plate with a plurality of protrusions;

a flipping device with a plurality of vacuum pads coupled to the
substrate tray, the flipping device to attach to the substrates, lift the
substrates out of the substrate tray, and flip the substrates;

10 a first actuator coupled to the plate, the first actuator to raise
and lower the plate;

a second actuator coupled to the flipping device, the second
actuator to lower and raise the flipping device;

a solder bump application station coupled to the flipping station, the
15 solder bump application station to apply and bond solder bumps to the
substrates; and

wherein the first actuator raises the plate into the bottom of the
substrate tray, the second actuator lowers the flipping device into the
substrate tray when the substrate tray is in the flipping station.

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20. The system of claim 19 further comprising a vacuum generator coupled to the flipping device, the vacuum generator to produce a vacuum at each vacuum pad of the flipping device to form a temporary bond between the vacuum pad and substrates.

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21. The system of claim 20, wherein the flipped substrates are placed back into the substrate tray after being flipped by the flipping station.

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